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Wurdeman

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(54) **HOSPITAL CHAIR BEDS WITH EXTENDABLE/RETRACTABLE FOOT SECTIONS**

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(51) **Int. Cl.**

A61G 7/015	(2006.01)
A61G 7/012	(2006.01)
A61G 7/16	(2006.01)

(52) **U.S. Cl.**

CPC ***A61G 7/015*** (2013.01); ***A61G 7/012*** (2013.01); ***A61G 7/16*** (2013.01)

(58) **Field of Classification Search**

CPC A61G 7/015; A61G 7/005; A61G 7/012; A61G 7/05; A61G 7/0506; A61G 7/16

See application file for complete search history.

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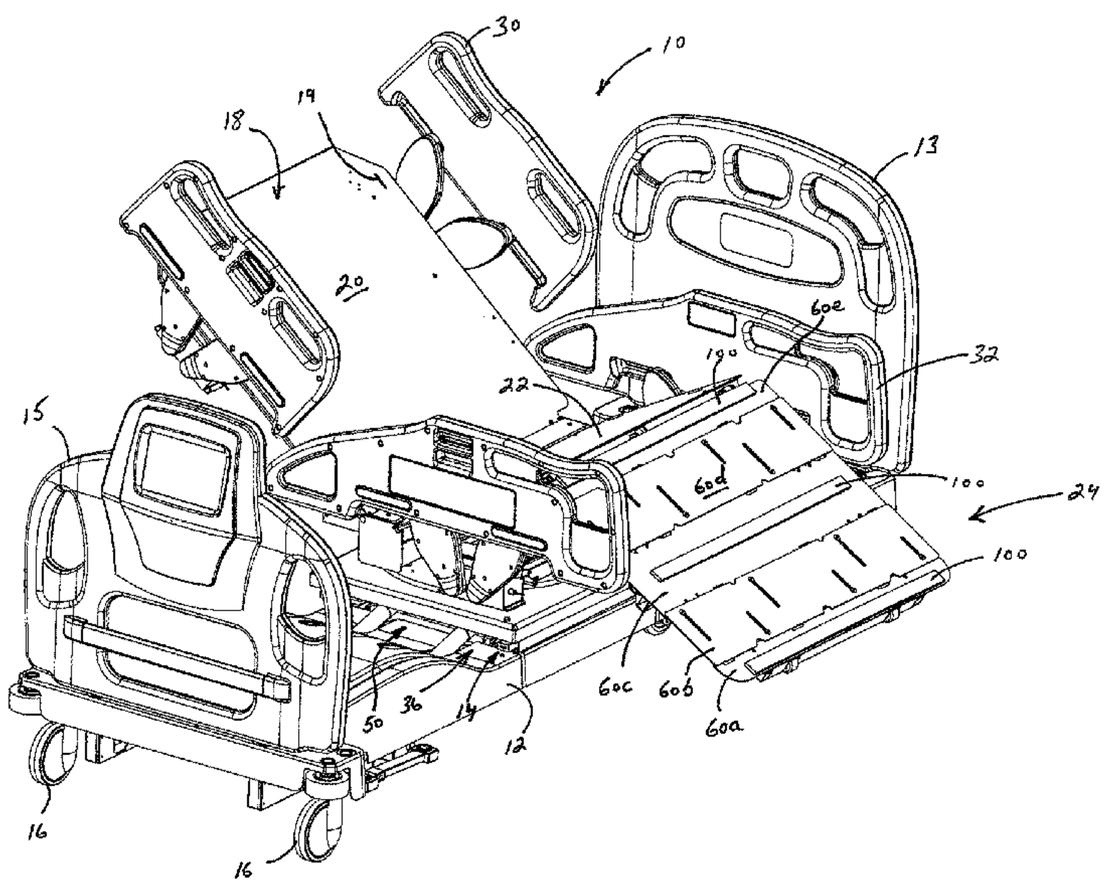
(57) **ABSTRACT**

A hospital bed includes a base, a lifting mechanism, a rotating frame configured to rotate horizontally relative to the base, and a patient support surface pivotally secured to the rotating frame. The patient support surface includes a back section, a seat section, and foot section that articulate relative to each other. The patient support surface translates from a bed configuration to a side-egress chair or stand assist configuration. The foot section includes a plurality of panels configured to move relative to each other in substantially parallel overlapping planes between an extended configuration and a retracted configuration when the patient support surface is in a chair or stand assist configuration. The foot section contacts a floor which causes the plurality of panels to move to the retracted configuration. Biasing members urge the plurality of panels to the extended configuration when the foot section no longer contacts the floor.

15 Claims, 11 Drawing Sheets



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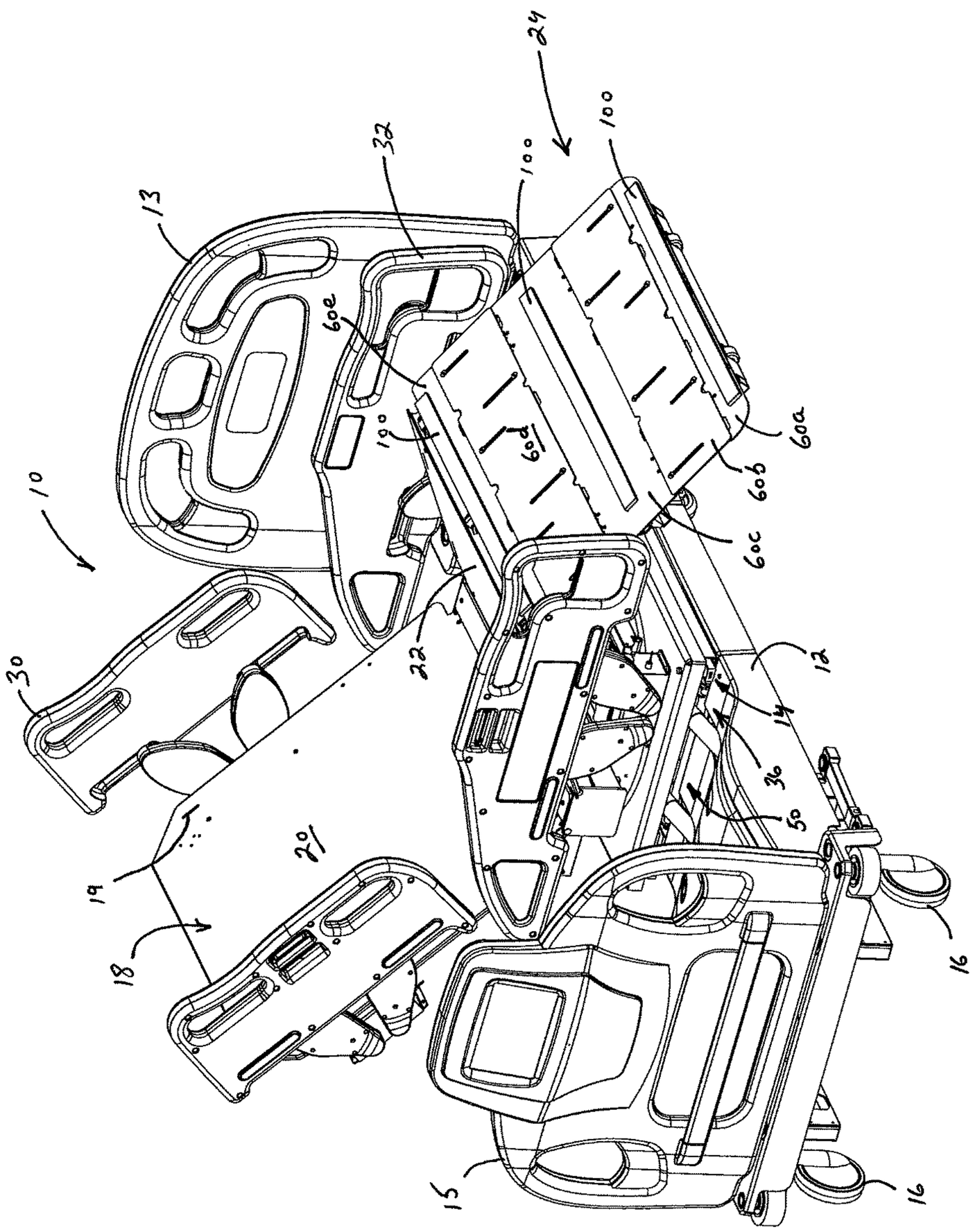
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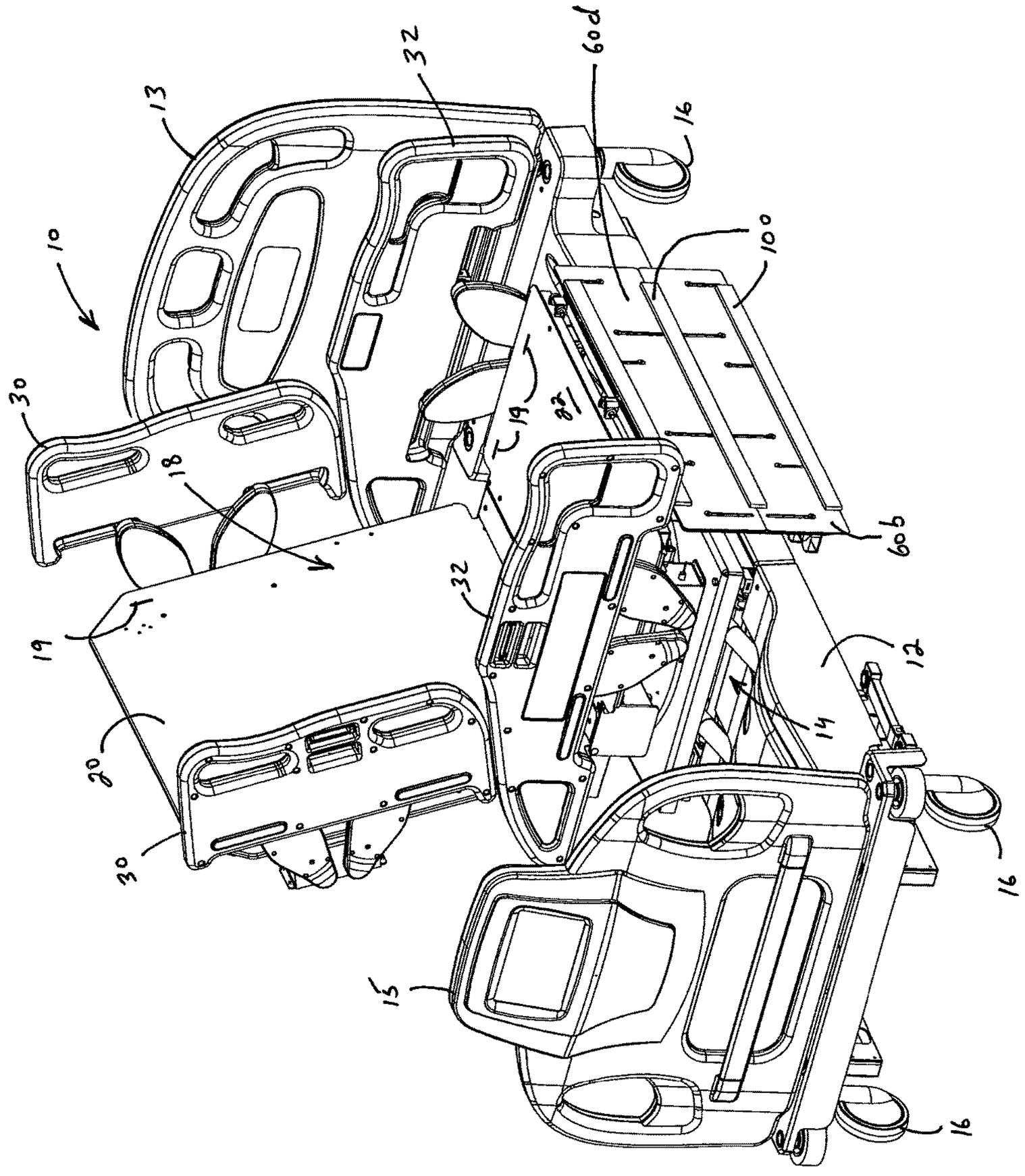
Fig.1



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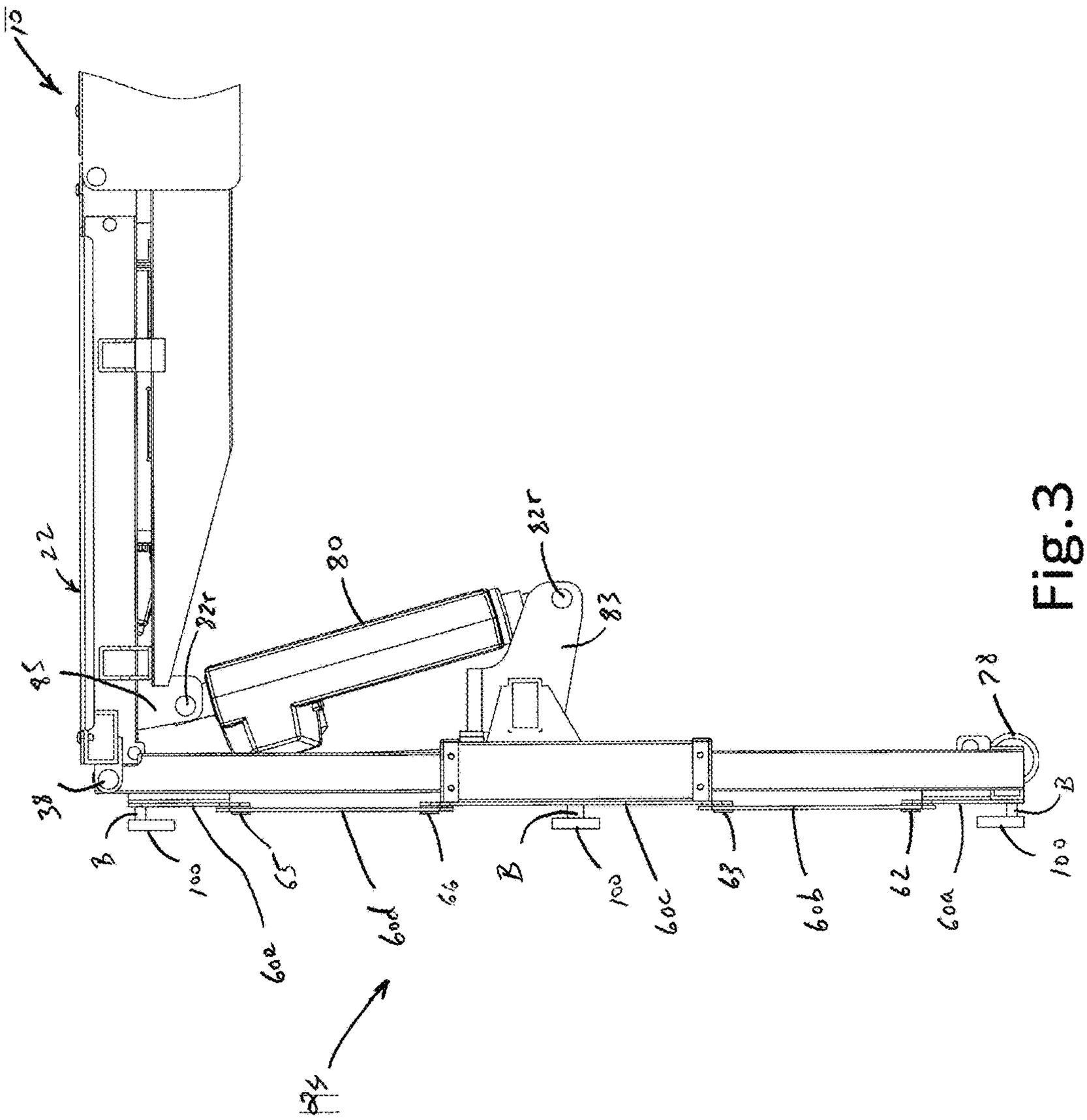
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Fig.3

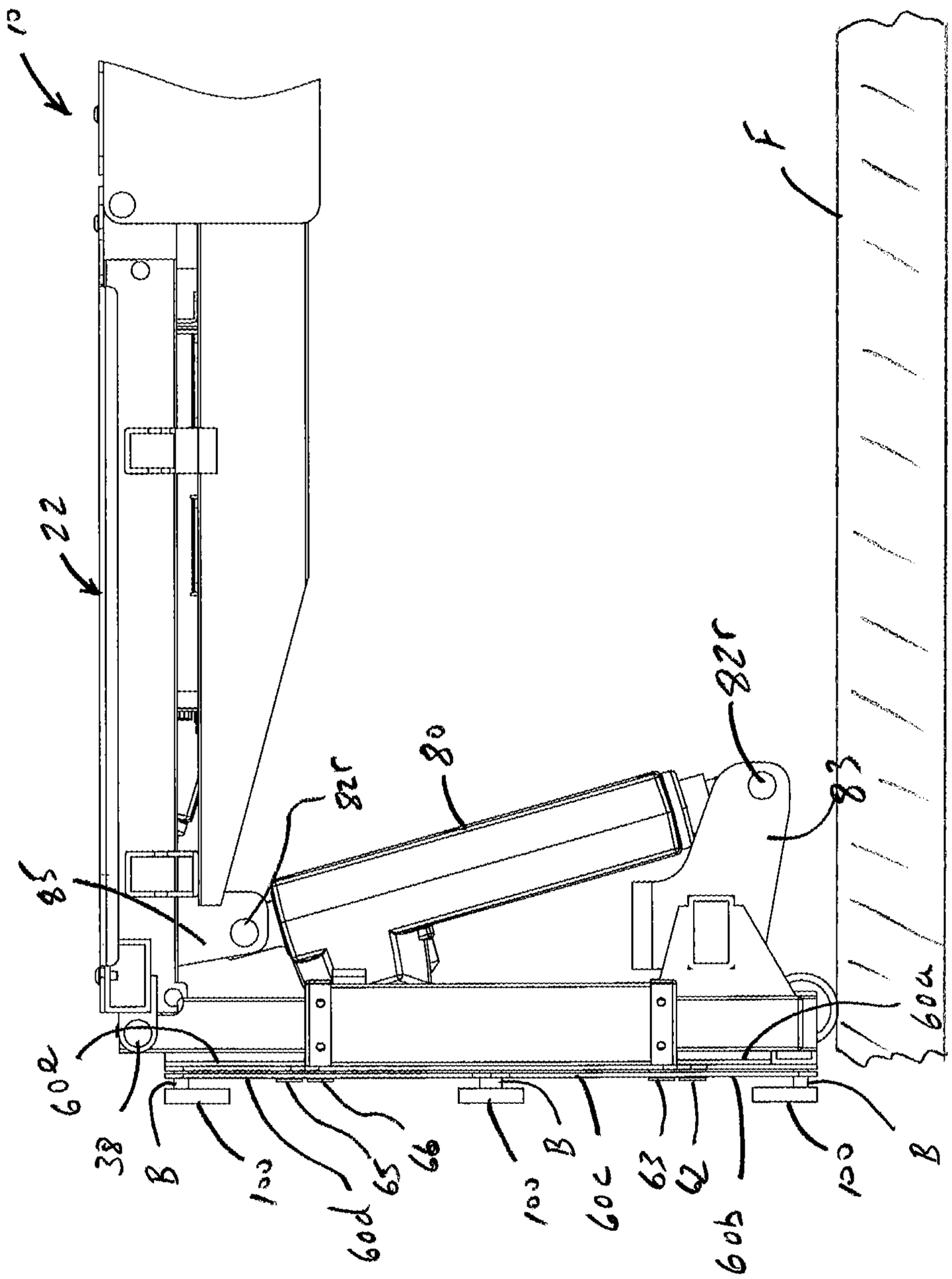
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Fig.4

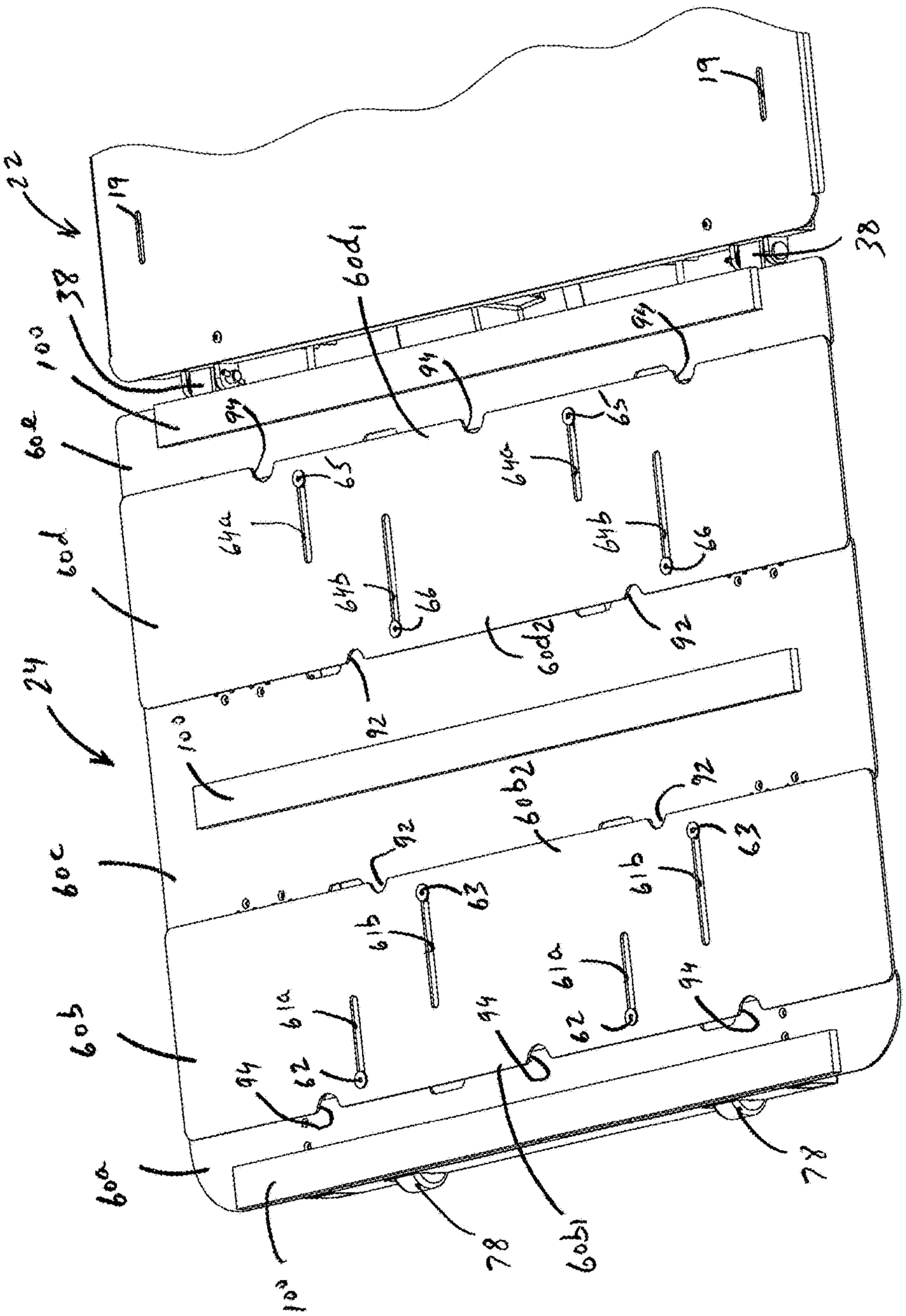
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Fig.5

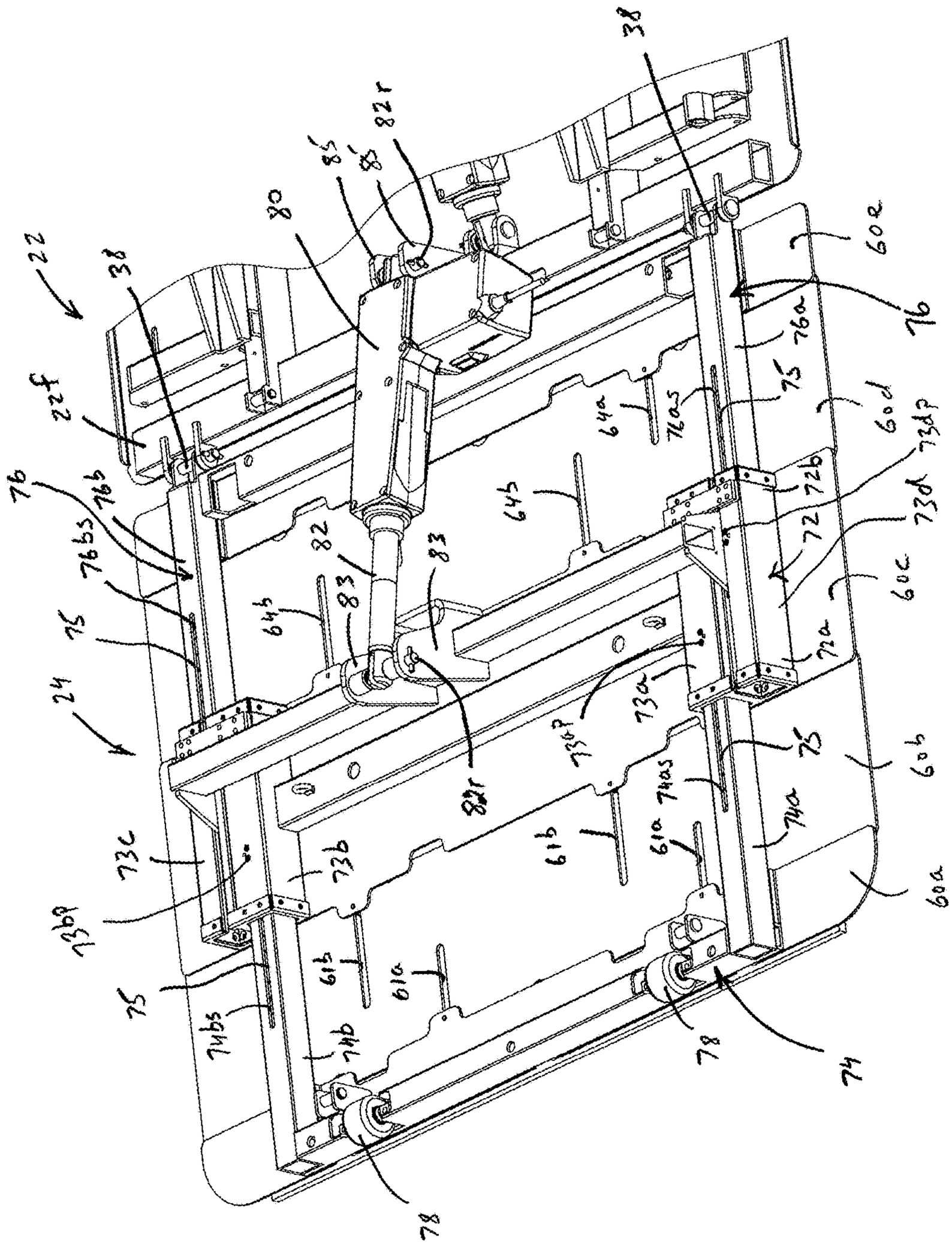
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Fig.6

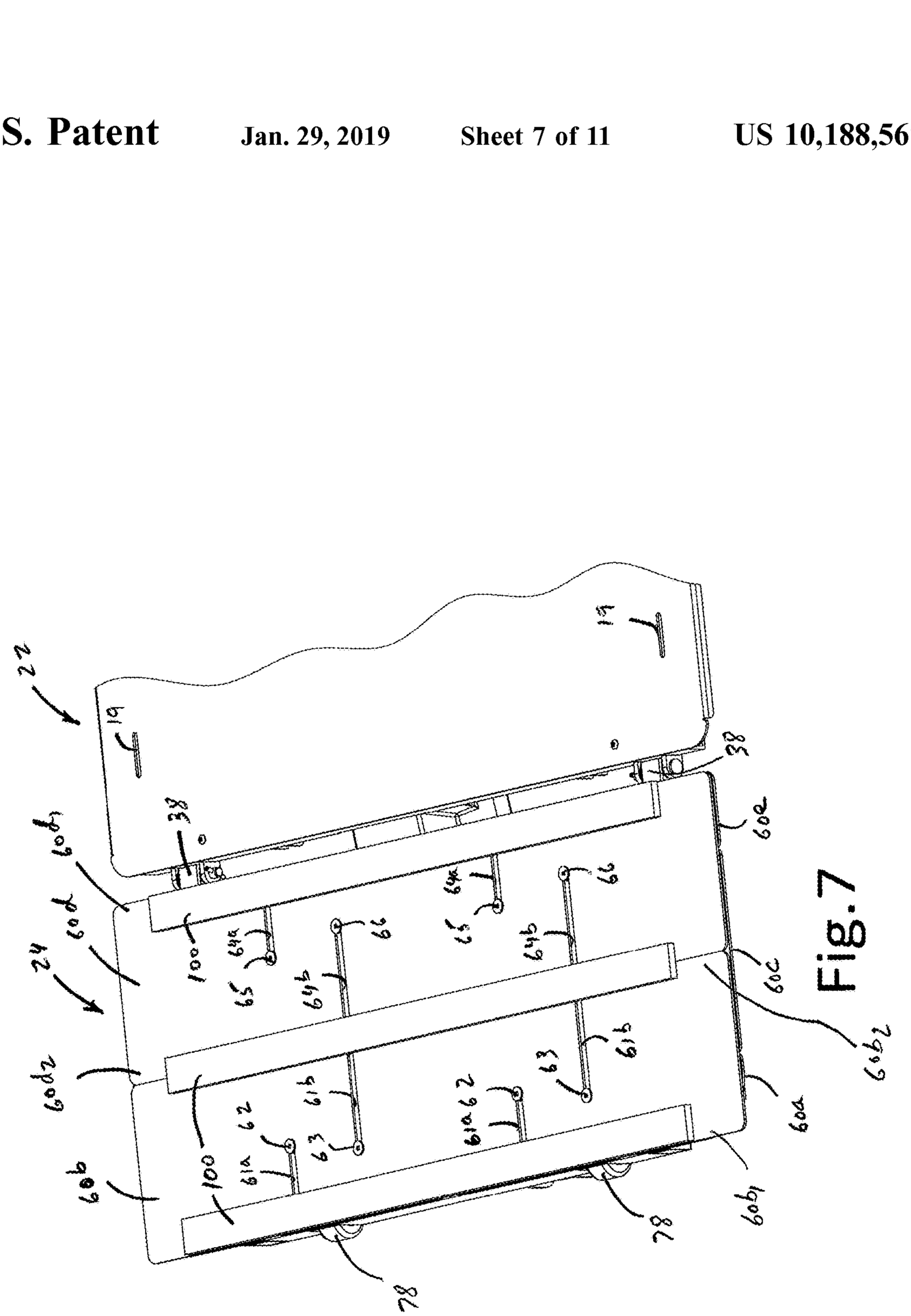
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Fig. 7

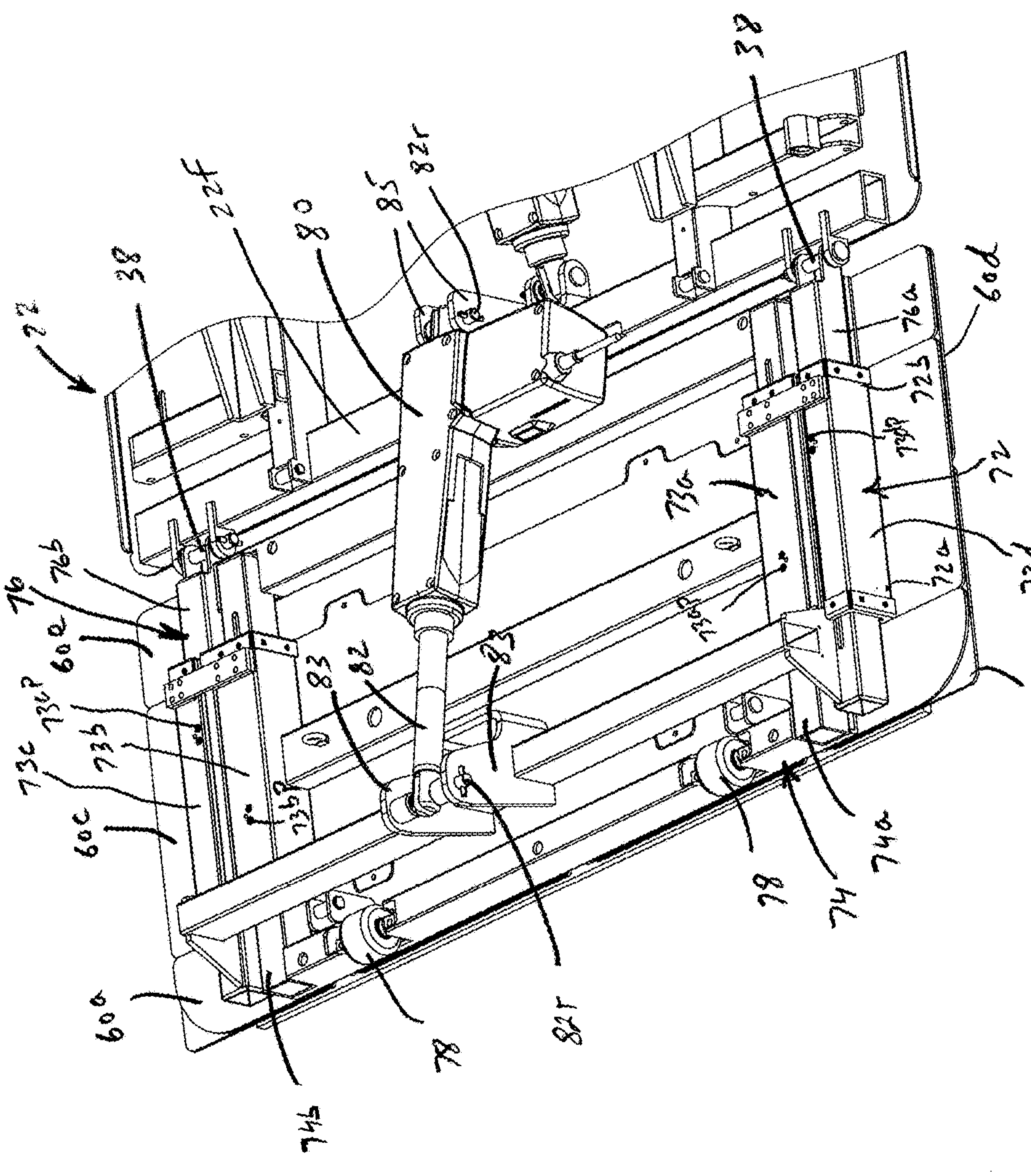
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Fig. 8

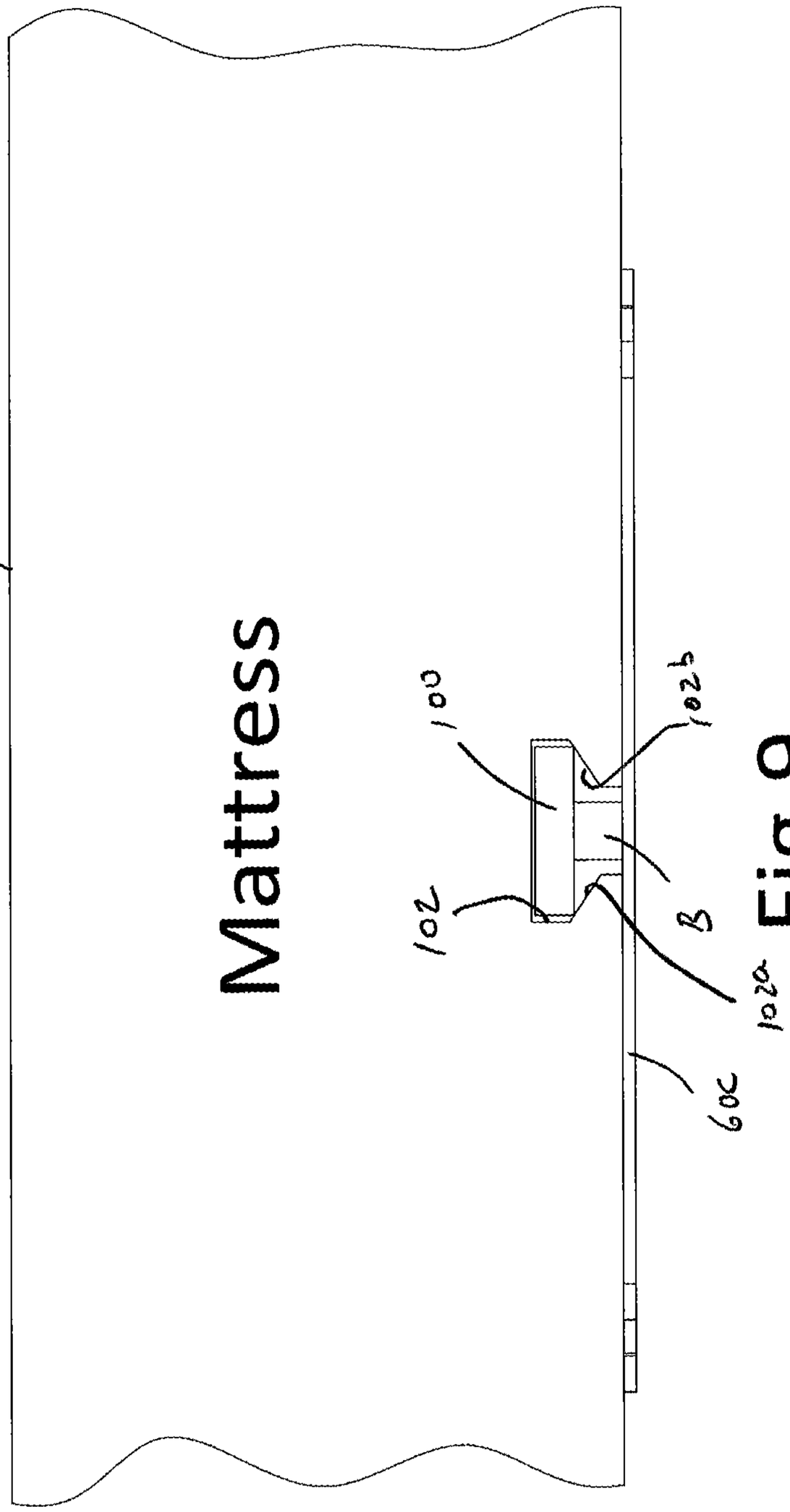
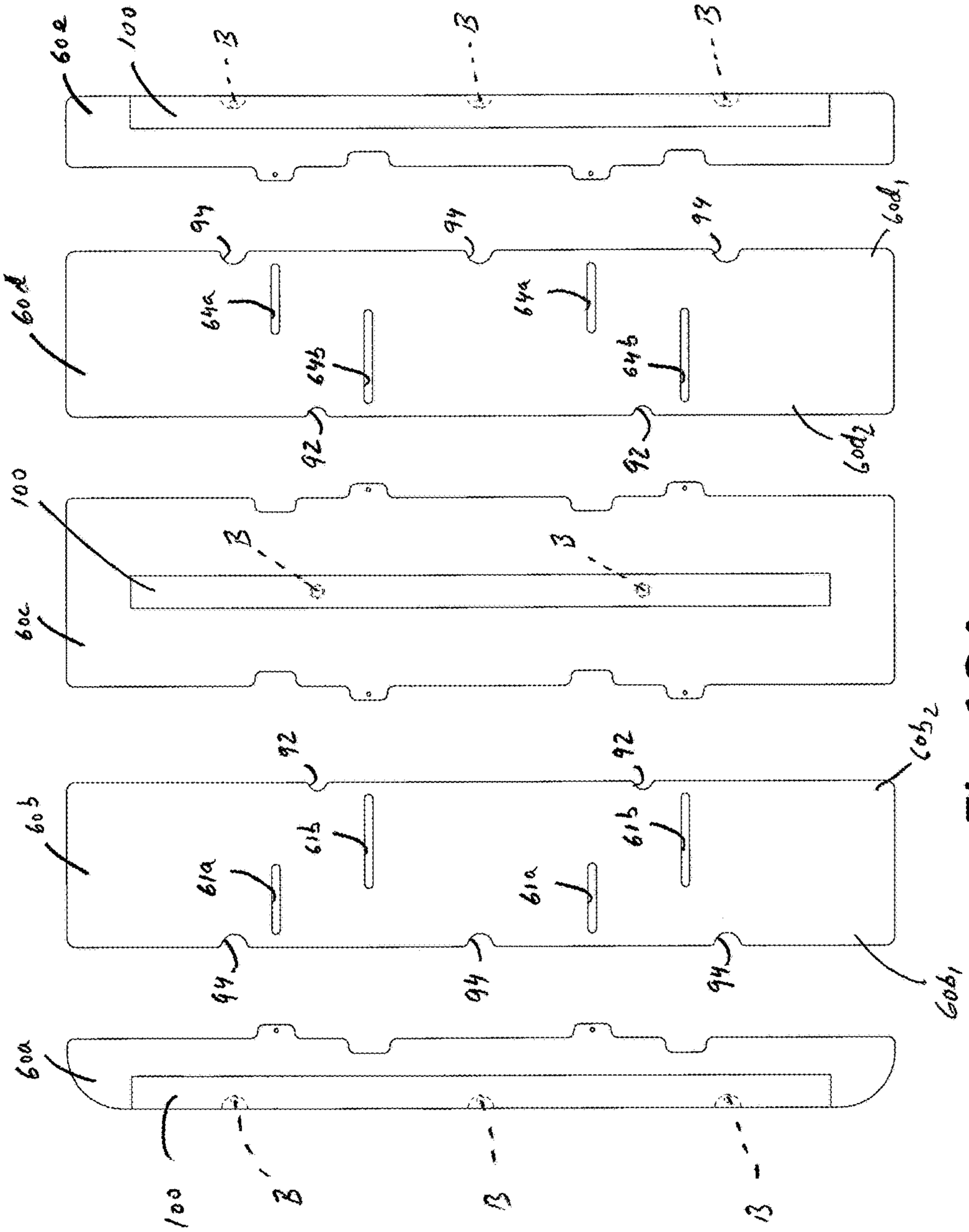


Fig.9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60c
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Fig.10A

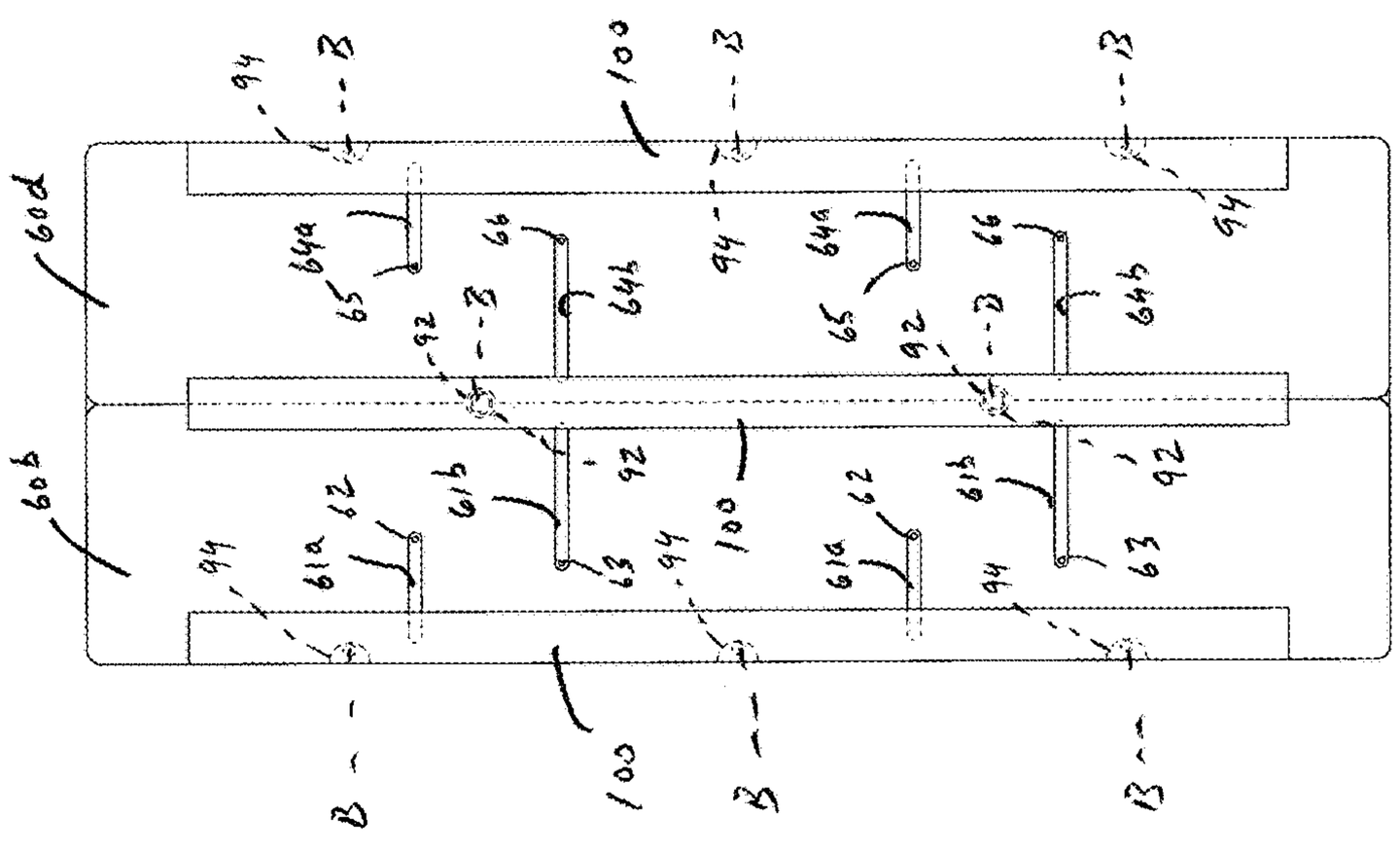

Fig.10B

HOSPITAL CHAIR BEDS WITH EXTENDABLE/RETRACTABLE FOOT SECTIONS

RELATED APPLICATIONS

This application claims the benefit of and priority to U.S. Provisional Patent Application No. 62/072,461 filed Oct. 30, 2014, and U.S. Provisional Patent Application No. 62/158,768 filed May 8, 2015, the disclosures of which are incorporated herein by reference as if set forth in their entireties.

FIELD OF THE INVENTION

The present invention relates generally to the field of hospital beds and, more specifically, to hospital beds that are convertible into a chair configuration.

BACKGROUND

Conventional hospital beds are configured to provide a sufficiently comfortable support surface for patients in a supine position. In many cases, it is desirable for patients to elevate from a supine position to a sitting position in order to increase the activity of the circulatory and cardiovascular systems and/or in the course of medical treatment. In addition, patients may be interested in sitting up in bed to be more comfortable, for example, in order to read or meet with visitors. However, it may be difficult for some patients to get out of a hospital bed. As such, hospital beds that can be converted into chair-like configurations have been developed. In addition, hospital beds that can assist patients in moving from a supine position to a sitting position for the purpose of achieving a standing or walking position have also been developed.

SUMMARY

According to some embodiments of the present invention, a hospital bed that can be converted to a chair configuration includes a base having opposite end portions, a lifting mechanism secured to the base between the end portions, and a patient support surface pivotally secured to the lifting mechanism. The patient support surface is configured to support a mattress thereon. The lifting mechanism is configured to raise the patient support surface and mattress relative to the base to a stand-assist configuration to facilitate egress by a patient. A rotating frame is mounted on the lifting mechanism and is configured to rotate horizontally relative to the base. The patient support surface is pivotally secured to the rotating frame and the patient support surface is configured to translate from a bed configuration to a side-egress chair configuration.

The patient support surface can include a back section, a seat section, and a foot section that are configured to articulate relative to each other. The patient support surface can be configured to translate from a bed configuration to a chair or stand assist configuration. The foot section includes a plurality of panels that are configured to move relative to each other in substantially parallel overlapping planes between an extended configuration and a retracted configuration. The foot section is configured to engage a floor surface when the patient support surface is in a chair configuration, and the engagement with the floor surface causes the plurality of panels to move to the retracted configuration. The foot section can include one or more biasing members, such as springs, that are configured to urge the plurality of panels to the extended configuration when the foot section is not engaged with the floor surface.

In some embodiments of the present invention, the foot section includes first, second, third, fourth, and fifth panels operably connected together. The first, third and fifth panels move relative to each other in a first one of the planes, and the second and fourth panels move relative to each other in a second one of the planes. The foot section includes a frame assembly that has a base with opposite first and second sides. A first section is telescopically secured to the base first side and is movable relative to the base between retracted and extended positions. A second section is telescopically secured to the base second side and is movable relative to the base between retracted and extended positions. The base includes one or more biasing members that are configured to urge the first and second sections of the frame assembly outwardly from the base to respective extended positions.

In some embodiments, the frame assembly first and second sections each include a plurality of spaced-apart elongated legs that are telescopically secured to the base. The base includes a respective plurality of biasing members associated with the first section legs that are configured to urge the first section outwardly from the base to a respective extended position. The base also includes a respective plurality of biasing members associated with the second section legs that are configured to urge the second section outwardly from the base to a respective extended position.

The first panel can be secured to the frame assembly first section, the third panel can be secured to the frame assembly base, and the fifth panel can be secured to the frame assembly second section. The second panel can be slidably secured to the first and third panels, and the fourth panel can be slidably secured to the third and fifth panels.

The frame assembly second section can be pivotally secured to the seat section and an actuator is configured to move the foot section between a substantially co-planar configuration relative to the seat section and a substantially orthogonal configuration relative to the seat section.

In some embodiments, the frame assembly first section includes at least one rolling member or wheel that is configured to contact the floor surface and roll along the floor surface as the foot section is moved to a substantially orthogonal configuration relative to the seat section.

According to other embodiments of the present invention, a method of translating a hospital bed to an egress configuration includes articulating back, seat and foot sections of a patient support surface relative to each other from a substantially co-planar configuration to a chair configuration. The foot section includes a plurality of panels that are configured to move relative to each other in substantially parallel overlapping planes between an extended configuration when the patient support surface is in a bed configuration and a retracted configuration when the patient support surface is in a chair configuration. The foot section contacts a floor surface to cause the plurality of panels to move to the retracted configuration.

In some embodiments, the foot section includes first, second, third, fourth, and fifth panels operably connected together. Contacting the floor surface with the foot section causes the first, third and fifth panels to move relative to each other in a first one of the planes, and causes the second and fourth panels to move relative to each other in a second one of the planes. In some embodiments, the back, seat and foot sections are rotated 90 degrees to a side egress position prior to contacting the floor surface with the foot section.

In some embodiments, some of the foot section panels include one or more mattress support members. As the foot

section panels are moved to a retracted configuration, the mattress support members move closer together thereby causing a portion of a mattress secured thereto to move to a retracted configuration.

It is noted that aspects of the invention described with respect to one embodiment, may be incorporated in a different embodiment although not specifically described relative thereto. That is, all embodiments and/or features of any embodiment can be combined in any way and/or combination. These and other objects and/or aspects of the present invention are explained in detail in the specification set forth below.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which form a part of the specification, illustrate embodiments of the present invention. The drawings and description together serve to fully explain the invention.

FIG. **1** is a top perspective view of a hospital chair bed in a chair configuration (side egress) and having an extendable/retractable foot section, shown in an extended configuration, according to some embodiments of the present invention.

FIG. **2** is a top perspective view of the hospital chair bed of FIG. **1** with the extendable/retractable foot section shown in a retracted configuration, according to some embodiments of the present invention.

FIG. **3** is a partial side view of the hospital chair bed of FIG. **1** illustrating the hospital chair bed in a chair configuration with the foot section in an extended configuration.

FIG. **4** is a partial side view of the hospital chair bed of FIG. **1** illustrating the hospital chair bed in a chair configuration with the foot section in a retracted configuration.

FIG. **5** is a top view of the foot section of the hospital chair bed of FIG. **1** illustrating the foot section in an extended configuration.

FIG. **6** is a bottom perspective view of the foot section of the hospital chair bed of FIG. **1** illustrating the foot section in an extended configuration.

FIG. **7** is a top view of the foot section of the hospital chair bed of FIG. **1** illustrating the foot section in a retracted configuration.

FIG. **8** is a bottom perspective view of the foot section of the hospital chair bed of FIG. **1** illustrating the foot section in a retracted configuration.

FIG. **9** is a side view of a foot section panel with one of the mattress support members illustrated in FIG. **1**, according to some embodiments of the present invention and illustrating a mattress that is secured thereto.

FIG. **10**A is a top plan view of a foot section, according to some embodiments of the present invention, with the panels thereof in an extended configuration, and illustrating cutouts and apertures that facilitate movement of the panels between extended and retracted configurations with mattress support members secured thereto.

FIG. **10**B illustrates the foot section of FIG. **10**A with the panels in a retracted configuration.

DETAILED DESCRIPTION

The present invention will now be described more fully hereinafter with reference to the accompanying figures, in which embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Like numbers refer to like elements throughout. In the figures, certain components or features may be exaggerated for clarity, and broken lines may illustrate optional features or elements unless specified otherwise. In addition, the sequence of operations (or steps) is not limited to the order presented in the figures and/or claims unless specifically indicated otherwise. Features described with respect to one figure or embodiment can be associated with another embodiment or figure although not specifically described or shown as such.

It will be understood that when a feature or element is referred to as being "on" another feature or element, it can be directly on the other feature or element or intervening features and/or elements may also be present. In contrast, when a feature or element is referred to as being "directly on" another feature or element, there are no intervening features or elements present. It will also be understood that, when a feature or element is referred to as being "connected", "attached" or "coupled" to another feature or element, it can be directly connected, attached or coupled to the other feature or element or intervening features or elements may be present. In contrast, when a feature or element is referred to as being "directly connected", "directly attached" or "directly coupled" to another feature or element, there are no intervening features or elements present. Although described or shown with respect to one embodiment, the features and elements so described or shown can apply to other embodiments.

The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, steps, operations, elements, components, and/or groups thereof. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items and may be abbreviated as "/".

As used herein, phrases such as "between X and Y" and "between about X and Y" should be interpreted to include X and Y. As used herein, phrases such as "between about X and Y" mean "between about X and about Y." As used herein, phrases such as "from about X to Y" mean "from about X to about Y."

Spatially relative terms, such as "under", "below", "lower", "over", "upper" and the like, may be used herein for ease of description to describe one element or feature's relationship to another element(s) or feature(s) as illustrated in the figures. It will be understood that the spatially relative terms are intended to encompass different orientations of a device in use or operation in addition to the orientation depicted in the figures. For example, if a device in the figures is inverted, elements described as "under" or "beneath" other elements or features would then be oriented "over" the other elements or features. Thus, the exemplary term "under" can encompass both an orientation of over and under. The device may be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors used herein interpreted accordingly. Similarly, the terms "upwardly", "downwardly", "vertical", "horizontal" and the like are used herein for the purpose of explanation only unless specifically indicated otherwise.

It will be understood that although the terms first and second are used herein to describe various features or elements, these features or elements should not be limited by

these terms. These terms are only used to distinguish one feature or element from another feature or element. Thus, a first feature or element discussed below could be termed a second feature or element, and similarly, a second feature or element discussed below could be termed a first feature or element without departing from the teachings of the present invention.

Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the specification and relevant art and should not be interpreted in an idealized or overly formal sense unless expressly so defined herein. Well-known functions or constructions may not be described in detail for brevity and/or clarity.

The term "about", as used herein with respect to a value or number, means that the value or number can vary more or less, for example by +/−20%, +/−10%, +/−5%, +/−1%, +/−0.5%, +/−0.1%, etc.

As used herein, the terms "comprise", "comprising", "comprises", "include", "including", "includes", "have", "has", "having", or variants thereof are open-ended, and include one or more stated features, integers, elements, steps, components or functions but does not preclude the presence or addition of one or more other features, integers, elements, steps, components, functions or groups thereof. Furthermore, as used herein, the common abbreviation "e.g.", which derives from the Latin phrase "exempli gratia," may be used to introduce or specify a general example or examples of a previously mentioned item, and is not intended to be limiting of such item. The common abbreviation "i.e.", which derives from the Latin phrase "id est," may be used to specify a particular item from a more general recitation.

Referring to FIGS. **1-2**, a hospital bed **10**, according to some embodiments of the present invention, is illustrated. The illustrated bed **10** has a base **12** and a rotating frame **14** mounted on the base **12**. The frame **14** is configured to rotate relative to the base **12** to facilitate side egress from the bed **10** by a patient, as will be described below. Casters **16** are mounted to the four corners of the base **12** and facilitate movement of the bed **10** about the hospital or other environment. In some embodiments, casters **16** are locking casters that can be selectively locked to prevent movement of the bed **10**.

The illustrated bed **10** has a patient support surface **18** configured to support a mattress M (FIG. **9**) on which a patient is situated. A portion of the mattress M may be attached to the patient support surface **18** via a plurality of straps (e.g., nylon webbing straps, etc.) attached to the mattress ticking. The straps extend down through various respective slots **19** formed in the patient support surface **18**, and can be fastened via connectors under the patient support surface **18**. Exemplary connectors are "D" rings. However, various types of connectors and various ways of securing a mattress to the patient support surface **18** can be utilized, without limitation. As will be described below, a portion of the mattress M overlying the foot section **2** can be secured to the patient support surface **18** via mattress support members secured to panels of the foot section **24**.

The patient support surface **18** is supported by the rotating frame **14** and includes a back section **20**, a seat section **22**, and a foot section **24**. The back section **20**, seat section **22** and foot section **24** can articulate with respect to each other and can be serially hinged or otherwise movably secured together, as illustrated. The back section **20** and seat section **22** can be pivotally attached to each other by pins, hinges, or other suitable mechanisms well known in the art. The seat section **22** and foot section **24** can also be pivotally attached to each other by pins, hinges, or other suitable mechanisms well known in the art.

In some embodiments, hospital bed **10** may have a patient support surface **18** that can be articulated into a chair configuration without rotating to a side egress position. For example, the patient support surface **18** articulates as described herein to a chair or stand assist configuration such that a patient can egress from the foot of the bed **10**.

A mattress M (FIG. **9**) supported by the patient support surface **18** may have a foot section **24** that can retract when the hospital chair bed **10** is moved from a bed configuration to a chair or stand assist configuration and the foot section **24** moves to a retracted configuration as described below. Various types of retractable mattress foot sections are described in U.S. Pat. No. 8,495,774, which is incorporated herein by reference in its entirety. The mattress foot section can be attached to the foot section **24** of the bed via mattress support members **100** (FIGS. **1**, **2**, **9**, **10**A-**10**B), as described below.

Still referring to FIGS. **1-2**, the illustrated bed **10** also has a first set of patient side rails **30** typically secured to the back section **20** in spaced-apart relationship and a second set of patient side rails **32** typically secured to the seat section **22** and/or foot section **24** in spaced-apart relationship, as illustrated. A head board **13** is secured to the base **12** at the head end of the bed **10** and a foot board **15** is secured to the base **12** at the foot end of the bed **10**, as would be understood by those skilled in the art.

The patient support surface **18** can be secured to the rotating frame **14** in various ways, for example via one or more of a transverse rod or pin connection **36** to facilitate tilting of the patient support surface **18** relative to the rotating frame **14**. The rotating frame **14** can be secured to the base **12** via a lift mechanism **50**, such as a double scissors lift, etc. The lift mechanism **50** is configured to raise and lower the patient support surface **18**, via the rotating frame **14**, relative to the base **12**. The lift mechanism **50** can be driven by hydraulic cylinders, air cylinders, air bags, and/or electrical or electromechanical devices, etc. The lift mechanism **50** can be configured to allow the patient support surface **18** to be raised relatively high relative to the base **12** and to be lowered relatively low with respect to the base **12**, as described above. See, e.g., U.S. Pat. No. 7,788,748 for examples of rotational and lift components, which is incorporated herein by reference in its entirety.

The foot section **24** may also be referred to as a "leg" section. Thus, the terms "foot section" and "leg section" are used interchangeably herein. The foot section **24** is pivotally connected to the seat section **22** of the articulating patient support surface **18**, for example, via one or more hinges **38** (FIGS. **3-8**).

Referring now to FIGS. **3-8**, the illustrated foot section **24** includes a plurality of panels **60***a*, **60***b*, **60***c*, **60***d*, **60***e* that are configured to move relative to each other in substantially parallel overlapping planes between an extended configuration (FIGS. **3**, **5** and **6**) and a retracted configuration (FIGS. **4**, **7**, **8** and **10**B) when the patient support surface **18** is in an egress chair configuration. The panels **60***a*-**60***e* are in the retracted configuration in FIGS. **7** and **8** for illustrative purposes although foot section **24** is in a parallel plane to the seat section **22** so that the patient support surface **18** is not in a chair configuration. The foot section **24** is configured to

engage a floor surface F (FIG. **4**) when the patient support surface **18** is in a chair configuration, and the engagement with the floor surface F causes the plurality of panels **60***a*-**60***e* to move to the retracted configuration, as described further below.

The illustrated foot section **24** includes a frame assembly **70** (FIG. **6**) that includes a base **72**, a first section **74** telescopically secured to one side **72***a* of the base **72** and movable relative to the base **72** between retracted and extended positions, and a second section **76** telescopically secured to the opposite side **72***b* of the base **72** and movable relative to the base **72** between retracted and extended positions. The frame assembly first and second sections **74**, **76** are illustrated in their respective extended positions in FIGS. **5** and **6**, and are illustrated in their respective retracted positions in FIGS. **7**-**8**.

The illustrated frame assembly first section **74** includes a pair of spaced-apart elongated legs **74***a*, **74***b* that are telescopically secured within respective receiving members **73***a*, **73***b* of the base **72**. The receiving members **73***a*, **73***b* can be tubular as shown with a rectangular shape corresponding to the legs **74***a*, **74***b*, but other shapes can be used. Each receiving member **73***a*, **73***b* can include a biasing member **75**, such as a spring, that is associated with a respective one of the legs **74***a*, **74***b* and that is configured to urge the frame assembly first section **74** outwardly from the base **72** to an extended position. In the illustrated embodiment, each leg **74***a*, **74***b* includes a guiding slot **74***as*, **74***bs* that is cooperatively engaged with a respective member, such as a rod or pin **73***ap*, **73***bp* in receiving members **73***a*, **73***b*.

The illustrated frame assembly second section **76** includes a pair of spaced-apart elongated legs **76***a*, **76***b* that are telescopically secured within respective receiving members **73***c*, **73***d* of the base **72**. The receiving members **73***c*, **73***d* can be tubular as shown with a rectangular shape corresponding to the legs **76***a*, **76***b*, but other shapes can be used. Each receiving member **73***c*, **73***d* can include a biasing member **75**, such as a spring, that is associated with a respective one of the legs **76***a*, **7***b* and that is configured to urge the frame assembly second section **76** outwardly from the base **72** to an extended position. In the illustrated embodiment, each leg **76***a*, **76***b* includes a guiding slot **76***as*, **76***bs* that is cooperatively engaged with a respective member, such as a rod or pin **73***cp*, **73***dp* in receiving members **73***c*, **73***d*.

The first panel **60***a* is secured to the frame assembly first section **74**, the third panel **60***c* is secured to the frame assembly base **72**, and the fifth panel **60***e* is secured to the frame assembly second section **76**. The second panel **60***b* includes a first set of spaced-apart elongated slots **61***a* adjacent one edge portion **60***b*$_1$ thereof, and a second set of spaced-apart elongated slots **61***b* adjacent one edge portion **60***b*$_2$ thereof, as illustrated in FIG. **5**. A plurality of pins or rods **62** extend from the first panel **60***a* and each engages a respective one of the slots **61***a*. Similarly, a plurality of pins or rods **63** extend from the third panel **60***c* and each engages a respective one of the slots **61***b*. Rods **62**, **63** may be various types of members including pins, screws, bolts, rivets, etc., that allow for panel sliding motion. The term "rod" is used broadly to include various types of mechanical connectors or links, such as pins, bars, plates, etc.

The slots closer to one edge portion of a panel may be longer than slots closer to the opposing edge portion of a respective panel, in some embodiments. In the illustrated embodiment, slots **61***b* are longer than slots **61***a*, and slots **64***b* in panel **60***d* are longer than slots **64***a* in panel **60***d*. In the illustrated embodiment, slots **61***a* and **61***b* are parallel and extend longitudinally, and slots **64***a* and **64***b* are parallel and extend longitudinally.

This configuration of slots **61***a*, **61***b* and respective rods or pins **62**, **63** allows the first and third panels **60***a*, **60***c* to slide towards each other when the frame assembly first section **74** is moved to the retracted position. When the frame assembly first section **74** is moved to the retracted position, as illustrated in FIGS. **7** and **8**, the first and third panels **60***a*, **60***c* are in contacting or substantially contacting relationship and the second panel **60***b* overlies the first panel **60***a* and a portion (e.g., between about 20%-90%, such as about 40%, about 50%, about 60%, etc.) of the third panel **60***c*.

The fourth panel **60***d* includes a first set of spaced-apart elongated slots **64***a* adjacent one edge portion **60***d*$_1$ thereof, and a second set of spaced-apart elongated slots **64***b* adjacent one edge portion **60***d*$_2$ thereof, as illustrated in FIG. **5**. A plurality of pins or rods **65** extend from the fifth panel **60***e* and each engages a respective one of the slots **64***a*. Similarly, a plurality of pins or rods **66** extend from the third panel **60***c* and each engages a respective one of the slots **64***b*. Rods **65**, **66** may be various types of members including pins, screws, bolts, rivets, etc., that allow for panel sliding motion. The term "rod" is used broadly to include various types of mechanical connectors or links, such as pins, bars, plates, etc.

This configuration of slots **64***a*, **64***b* and respective rods **65**, **66** allows the fifth and third panels **60***e*, **60***c* to slide towards each other when the frame assembly second section **76** is moved to the retracted position. When the frame assembly second section **76** is moved to the retracted position, as illustrated in FIGS. **7** and **8**, the fifth and third panels **60***e*, **60***c* are in contacting or substantially contacting relationship and the fourth panel **60***d* overlies the fifth panel **60***e* and a portion (e.g., between about 20%-90%, such as about 40%, 50%, 60%, etc.) of the third panel **60***c*.

In the illustrated embodiment, as the frame assembly first and second sections **74**, **76** are moved between extended and retracted positions, the first, third and fifth panels **60***a*, **60***c*, **60***e* move relative to each other in a first plane, and the second and fourth panels **60***b*, **60***d* move relative to each other in a second plane that is substantially parallel with the first plane. When viewed from above the foot section **24** (FIGS. **5** and **7**), the second and fourth panels **60***b*, **60***d* move relative to each other in a second plane that overlaps the first plane. When viewed from below the foot section **24** (FIGS. **6** and **8**) the first, third and fifth panels **60***a*, **60***c*, **60***e* move relative to each other in the first plane that overlaps the second plane.

Referring to FIGS. **6** and **8**, an actuator **80** can be utilized to move the foot section **24** between a substantially co-planar configuration relative to the seat section **22** and a substantially orthogonal configuration relative to the seat section **22**. The illustrated actuator **80** is secured to a frame **22***f* of the seat section **22** via a bolt or other fastener **82***r* that engages bracket **85** and includes a piston rod **82** that is attached to the frame assembly base **72** via a bolt or other fastener **82***r* that engages bracket **83**, as would be understood by one skilled in the art. The actuator **80** may be any of various types of actuators (e.g., an electrical actuator, pneumatic or hydraulic cylinders, or other suitable electromechanical devices, etc.).

Referring to FIGS. **3**-**8**, the frame assembly first section **74** of the illustrated foot section **24** includes at least one roller or wheel **78**, shown as a plurality of spaced apart rollers/wheels, that are rotatably secured to the frame assembly first section **74**. These wheels **78** are configured to

contact a floor surface F and roll along the floor surface F as the foot section **24** is moved to the substantially orthogonal configuration relative to the seat section **22** via the actuator **80** in either a side egress or end egress configuration. The engagement of the wheels **78** with the floor surface F causes the frame assembly first and second sections **74**, **76** to move to respective retracted positions, thereby causing the panels **60***a*-**60***e* to move to the retracted configuration as illustrated in FIG. **4**.

Alternatively, the articulated patient support surface **18** can be rotated in an elevated configuration to a side egress position with the foot section **24** in the extended configuration (FIG. **3**). By lowering the patient support surface **18** via the lift mechanism **50**, the foot section **24** contacts the floor surface and moves to a retracted configuration (FIG. **4**).

In operation, the bed **10** can have the back section **20**, seat section **22**, and foot section **24** in a horizontal configuration, to support a patient in a supine position. To convert the bed **10** to a chair configuration, the back section **20**, seat section **22** and foot section **24** articulate relative to each other as shown in FIG. **1**, by actuators (e.g., pneumatic or hydraulic cylinders or other suitable electrical devices or electromechanical devices). For example, an actuator (not shown) can be utilized to pivot the back section **20** upwardly relative to the seat section **22**. Another actuator **80** can be configured to pivot the foot section **24** relative to the seat section **22**, as described above.

The transformation to a chair configuration can be carried out so that, the back section **20** and seat section **22** can be pivoted relative to each other (FIG. **1**) and the foot section **24** and seat section **22** are at least somewhat pivoted relative to each other (FIG. **1**). The articulated patient support surface **18** can be rotated approximately ninety degrees (90°) to permit side egress from the bed **10**, as illustrated in FIG. **1**.

Referring to FIGS. **10**A-**10**B, a foot section **24** according to some embodiments of the present invention is illustrated. The illustrated foot section **24** includes a plurality of panels **60***a*, **60***b*, **60***c*, **60***d*, **60***e*, as described above. The panels **60***a*, **60***b*, **60***c*, **60***d*, **60***e* include apertures and cutouts that facilitate attachment of a mattress to the foot section **24**. In the illustrated embodiment, panel **60***b* includes a plurality of spaced apart cutouts **94** along edge portion $\mathbf{60}b_1$, and a plurality of spaced apart cutouts **92** along edge portion $\mathbf{60}b_2$. Panel **60***d* includes a plurality of spaced apart cutouts **94** along edge portion $\mathbf{60}d_1$, and a plurality of spaced apart cutouts **92** along edge portion $\mathbf{60}d_2$.

The cutouts **94** of panel **60***b* are arranged such that, when panel **60***b* overlies panel **60***a* when the foot section **24** is in a retracted configuration, the cutouts **94** provide room for the mattress support member fasteners B, as illustrated in FIG. **10**B. The cutouts **92** of panels **60***b* and **60***d* are arranged such that, when panels **60***b* and **60***d* overlie panel **60***c* when the foot section **24** is in a retracted configuration, cutouts **92** and apertures **90** in panel **60***c* align with each other (e.g., are stacked, one above or to the side of the other, etc.), as illustrated in FIG. **10**B. The cutouts **94** of panel **60***d* are arranged such that, when panel **60***d* overlies panel **60***e* when the foot section **24** is in a retracted configuration, the cutouts **94** provide room for the mattress support member fasteners B, as illustrated in FIG. **10**B.

In the illustrated embodiment, mattress support members **100** are secured to panels **60***a*, **60***c*, **60***e*, for example, via fasteners B such as bolts or screws, etc. The mattress support members **100** are shown in phantom line in FIGS. **10**A-**10**B for ease of illustration. When the foot section **24** is moved to a retracted configuration, as illustrated in FIG. **10**B, panels **60***b* and **60***d* move from the spaced apart configuration of FIG. **10**A to the adjacent configuration of FIG. **10**B so as to overlie panel **60***c*. The cutouts **92** in panels **60***b* and **60***d* align with each other so as not to interfere with the mattress support members **100**. Similarly, panel **60***a* moves underneath panel **60***b* and panel **60***e* moves underneath panel **60***d* such that the cutouts **94** do not to interfere with the mattress support members B.

Each mattress support member **100** can be configured to cooperate with an elongated clip **102** secured to or integral with a foot section of a mattress M, as illustrated in FIG. **9**. (Only a single mattress support member **100** that is attached to panel **60***a* is shown in FIG. **9**.) Each mattress support member **100** can be secured to a respective panel **60***a*, **60***c*, **60***e* in elevated, spaced apart relationship via fasteners B such that a respective elongated clip **102** can slidably engage a mattress support member **100**. In the illustrated embodiment, each clip **102** has tapered sidewalls **102***a*, **102***b*. However, various configurations are possible. The illustrated configuration allows for easy attachment of a mattress M to the patient support surface **18** of the bed **10** (FIG. **1**).

In the drawings and specification, there have been disclosed typical preferred embodiments of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being set forth in the following claims.

That which is claimed:

1. A hospital bed, comprising:

a base comprising opposite end portions;

a lifting mechanism secured to the base between the end portions; and

a patient support surface pivotally secured to the lifting mechanism, wherein the patient support surface comprises a back section, a seat section, and a foot section configured to articulate relative to each other, and wherein the patient support surface is configured to translate from a bed configuration to a chair configuration;

wherein the foot section comprises first, second, third, fourth, and fifth panels operably connected together that are configured to move relative to each other in substantially parallel overlapping planes between an extended configuration when the patient support surface is in a bed configuration and a retracted configuration when the patient support surface is in a chair configuration, wherein the first, third and fifth panels move relative to each other in a first plane, and wherein the second and fourth panels move relative to each other in a second plane.

2. The hospital bed of claim **1**, wherein a free end of the foot section is configured to contact a floor surface when the patient support surface is in a chair configuration, and wherein contact with the floor surface forces the plurality of panels to move to the retracted configuration.

3. The hospital bed of claim **2**, wherein the foot section comprises at least one biasing member configured to urge the plurality of panels to the extended configuration.

4. The hospital bed of claim **1**, wherein the foot section further comprises a frame assembly, the frame assembly comprising:

a foot section base having opposite first and second sides;

a first section telescopically secured to the foot section base first side and movable relative to the foot section base between retracted and extended positions; and

a second section telescopically secured to the foot section base second side and movable relative to the foot section base between retracted and extended positions.

5. The hospital bed of claim **4**, wherein the foot section base comprises at least one biasing member configured to urge the first and second sections outwardly from the base to respective extended positions.

6. The hospital bed of claim **4**, wherein the first and second sections each comprise a plurality of spaced-apart elongated legs telescopically secured to the base, wherein the base comprises a respective plurality of biasing members associated with the first section legs that are configured to urge the first section outwardly from the base to a respective extended position, and wherein the base comprises a respective plurality of biasing members associated with the second section legs that are configured to urge the second section outwardly from the base to a respective extended position.

7. The hospital bed of claim **4**, wherein the first panel is secured to the first section, the third panel is secured to the base, and the fifth panel is secured to the second section.

8. The hospital bed of claim **7**, wherein the second panel is slidably secured to the first and third panels, and the fourth panel is slidably secured to the third and fifth panels.

9. The hospital bed of claim **4**, wherein the second section of the frame assembly is pivotally secured to the seat section.

10. The hospital bed of claim **4**, further comprising an actuator configured to move the foot section between a substantially co-planar configuration relative to the seat section and a substantially orthogonal configuration relative to the seat section.

11. The hospital bed of claim **10**, wherein the frame assembly first section is configured to contact a floor surface when the foot section is moved to the substantially orthogonal configuration relative to the seat section, and wherein contact with the floor surface causes the frame assembly first and second sections to move to respective retracted positions.

12. The hospital bed of claim **11**, wherein the frame assembly first section comprises at least one roller or wheel configured to contact the floor surface and roll along the floor surface as the foot section is moved to the substantially orthogonal configuration relative to the seat section.

13. The hospital bed of claim **1**, wherein the lifting mechanism is configured to raise and lower the patient support surface relative to the base, and further comprising a rotating frame mounted on the lifting mechanism, wherein the rotating frame is configured to rotate horizontally relative to the base, wherein the patient support surface is pivotally secured to the rotating frame, and wherein the patient support surface is configured to translate from a bed configuration to a side-egress chair configuration.

14. A method of translating a hospital bed to an egress configuration, wherein the bed comprises a base having opposite end portions, a lifting mechanism secured to the base between the end portions, and a patient support surface pivotally secured to the lifting mechanism, the method comprising:

articulating back, seat and foot sections of the patient support surface relative to each other from a substantially co-planar configuration to a chair configuration, wherein the foot section includes a plurality of panels that are configured to move relative to each other in substantially parallel overlapping planes between an extended configuration when the patient support surface is in a bed configuration and a retracted configuration when the patient support surface is in a chair configuration, wherein the foot section comprises first, second, third, fourth, and fifth panels operably connected together; and

contacting a floor surface with the foot section such that the first, third and fifth panels move relative to each other in a first plane, and such that the second and fourth panels move relative to each other in a second plane parallel to and over or under the first plane; and

forcing the plurality of panels to move to the retracted configuration in response to the floor contact.

15. The method of claim **14**, further comprising rotating the back, seat and foot sections 90 degrees to a side egress position prior to the contacting step.

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